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Bulletin 268 February 1936

Milk-Production Costs in West Virginia

I. A Study of the Costs Incurred by 51 Farms in the Morgantown and Fairmont Markets in 1934-1935

by L. F. HERRMANN, R. O. STELZER,
and G. A. BOWLING

AGRICULTURAL EXPERIMENT STATION
COLLEGE OF AGRICULTURE, WEST VIRGINIA UNIVERSITY
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MORGANTOWN

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Milk Production Costs In West Virginia

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by L. F. HERRMANN, R. O. STELZER, and G. A. BOWLING

CONFRONTED WITH LOW MILK PRICES, West Virginia dairymen have tried to meet the situation by making determined efforts to better their marketing position and by reducing costs wherever possible. Higher prices for milk have been felt to be a necessity and have been sought by groups of milk producers bargaining directly with distributors or attempting to obtain legislative regulation of the market. The determination of fair prices, either by bargaining or by legislation, demands accurate and unbiased data concerning costs of milk production. There have not been available, however, any cost figures based on West Virginia conditions.

Besides being essential as a basis for bargaining, cost of production figures are necessary to the dairyman who wishes to follow the wisest course in reducing his costs. By showing the important factors of cost and goals along the road to efficient production, cost figures may help the alert dairyman to realize an adequate return for his labor and capital from prices that might not even buy the feed for the cows in unwisely managed herds.

In order to determine the costs of producing milk in West Virginia and the factors influencing them, this study was undertaken by the departments of farm economics and dairy husbandry of the State Agricultural Experiment Station.

METHOD OF COLLECTING DATA

For the report presented here the data were gathered from the Morgantown and Fairmont markets, other markets of the state being left for later studies. "Market" in this report is used to describe the area from which a town receives its milk supply.

Fifty-one farms, selected at random from milk producers in these two markets, were visited six times each at two-month intervals. At

ACKNOWLEDGMENT

Credit is hereby given to the dairymen who provided information and accommodations for the fieldman during this study. They were put to considerable additional effort to furnish inventories and records of farm expenses and incomes. Each provided meals and lodging for the fieldman during his bi-monthly visits, the expenses incurred for those items representing an appreciable share of the cost of the study. Cooperation so willingly and generously given, in addition to making the study possible, contributed greatly to the accuracy and value of the results.

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each of these visits each cow's milk was weighed at two milkings and sampled and tested to determine the percentage of butterfat. The amount of feed offered to the cows also was weighed. In this way feed and production records were acquired for individual cows. The amount of time spent in milking, feeding, caring for the milk, and other work around the dairy herd also was observed and recorded at each visit.

The farm operators provided information about their crop production and feed purchases, which was checked against the feed records for individual cows. The amount of milk used on the farm was estimated by the operator and, when combined with the amount of milk sold, provided a check on the estimate of milk production based on the bi-monthly weighings.

The livestock, buildings, equipment, and land on each farm were inventoried at the first visit of the fieldman and again at a seventh visit twelve months later. At each visit the farm operator furnished an account of the current expenses incurred since the last visit. The taking of records was begun on April 1, 1934, in the Morgantown market and on May 1, 1934, in the Fairmont market and continued for twelve months. Of the 51 farms, 24 sold their product in Morgantown, and 27 sold in Fairmont. These comprised approximately one-third of the dairy farms in each market.

ORGANIZATION OF THE FARMS

Sources of income More than 90% of the income of farms in the Morgantown area was made from the dairy, the least on any farm being 43%. In the Fairmont market farmers were even more dependent on the dairy, since they received from it 97% of their total farm income. The number and importance of supplementary enterprises was greater on Morgantown than on Fairmont farms. The 24 Morgantown farms had 63 other income-producing enterprises. On the Fairmont farms only 43 such enterprises were found.

In figuring the gross income the values of products used on the farm were not included. Where hogs, for example, were raised only for family use, the value of hogs on hand was sometimes less at the end of the year than it had been at the beginning of the year. If no meat or animals had been sold, the result would be a loss, or a minus gross income for the hog enterprise. In the case of hogs, this loss actually occurred on several Fairmont farms; enough so that the hog enterprise had an average minus gross income of $6.00 per farm in the Fairmont area. Hog raising, obviously, was not done on a scale large enough to be a source of income on the farms studied. Some Fairmont farms sustained losses in their poultry enterprises also, and, in general, the farm enterprises besides the dairy yielded less income than those on the Morgantown farms. None of the Morgantown enterprises failed to yield some income. Tables 1 and 2 show the average incomes and their ranges.

TABLE 1—*Sources of gross income on 24 farms in the Morgantown Market (1934-1935)*

SOURCES OF INCOME	FARMS REPORTING	AVERAGE ANNUAL GROSS INCOME	PERCENTAGE OF TOTAL RECEIPTS FROM DIFFERENT SOURCES		
			Average	Maximum	Minimum
	Number	Dollars	%	%	%
*Dairy products**	24	$2,908	90.8	100	43.4
Cattle**	7	45	1.4	24.1	.0
Poultry and eggs**	20	73	2.3	22.2	.0
Sheep and wool**	1	2	.1	3.4	.0
Hogs**	14	32	1.0	15.7	.0
Grain	5	14	.4	12.7	.0
Hay	2	8	.2	6.0	.0
Other crops	7	72	2.3	22.3	.0
Miscellaneous receipts	7	49	1.5	16.5	.0
Total gross income	..	3,203	100	...	..

*Value at farm of milk sold wholesale, or delivered value of milk retailed, plus increase of inventory.

**These are net increases — sum of purchases plus value at beginning of year subtracted from sum of sales plus value at end of year. Value of products used by the household is not included.

Three Morgantown farm operators and 13 Fairmont farm operators depended on employment or a business away from the farm for part or most of their income.

It may seem contradictory, when herd sizes are noted in Table 3, that Fairmont herds should have had a larger gross income from 16 cows than Morgantown herds had from 22 cows. However, where the dairyman retailed his own milk, the gross income for bottling and delivering the milk was combined with the gross income of producing it. Eleven of the Fairmont farms in the study bottled and delivered

TABLE 2—*Sources of gross income on farms in the Fairmont Market (1934-1935)*

SOURCES OF INCOME	FARMS REPORTING	AVERAGE ANNUAL GROSS INCOME	PERCENTAGE OF TOTAL RECEIPTS FROM DIFFERENT SOURCES		
			Average	Maximum	Minimum
	Number	Dollars	%	%	%
*Dairy products**	27	$3,103	97.0	103.0	50.7
Cattle**	2	1	.0	1.0	.0
Poultry and eggs**	19	21	.7	6.4	—2.6
Sheep and wool**	2	25	.8	27.5	.0
Hogs**	13	—6	—.2	2.4	—2.0
Crops	3	39	1.2	44.5	.0
Miscellaneous receipts	4	16	.5	23.7	.0
Total gross income	27	3,200	100	...	..

*Value at farm of milk sold wholesale, or delivered value of milk retailed, plus net increase of inventory.

**These are net increases — sum of purchases plus value at beginning of year subtracted from sum of sales plus value at end of year. Value of products used by the household is not included.

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their own milk. Only three of the Morgantown farms in the study retailed their milk. Consequently the average gross dairy income of Fairmont farms may be thought of as being the income from two enterprises, while Morgantown gross dairy income was from one enterprise only.

The gross incomes averaged only $3,200, which suggests the question, will the farm operator have a fair living wage after his necessary operating expenses have been met?

Numbers of livestock kept The relative importance of the dairy may be shown by the fact that the number of dairy cattle was larger than the numbers of any other kind of livestock (Table 3). On the average, Morgantown farms kept 22 milk cows and 15 dairy heifers, calves, and bulls, and only 3 head of beef cattle, 68 head of poultry, 0.5 sheep, and 2 hogs. Fairmont farms kept 16 milk cows and 5 dairy calves, heifers, and bulls, with only 0.2 head of beef cattle, 42 head of poultry, 7 sheep, and 2 hogs.

TABLE 3—*Livestock on farms in the study (1934-1935)*

ITEM	AMOUNT OF STOCK PER FARM					
	24 Morgantown Farms			24 Fairmont Farms**		
	Average	Maximum	Minimum	Average	Maximum	Minimum
Milk cows, cow years*	21.8	50.1	7.7	15.8	39.5	3.8
Heifers, calves, and bulls	15.0	64.5	.0	5.5	20.5	.0
Beef cattle	3.0	33.5	.0	.2	2.5	.0
Poultry	68.2	325.0	.0	41.6	175.0	.0
Sheep	.5	12.0	.0	7.1	139.5	.0
Hogs	2.1	9.5	.0	1.8	6.5	.0
Horses, mules, and colts	2.6	7.5	.0	2.3	5.0	.0

*Average number of cows in herd during year. For example, two cows kept in the herd for six months each would equal one cow year.
**No information obtained on three farms.

Crop practices and use made of farm land The cropping practices of the region are influenced largely by the topography of the land, which is mostly hilly or steep. This makes it difficult to grow small grains economically, and as a result most of the land is used for pasture and hay crops. The total production of roughage in 1934 nearly equalled the requirements of the livestock kept on the farms in this study, but considerable quantities of grain had to be purchased.

The average number of acres per farm used for pasture was large. Morgantown farms, averaging 184.3 acres in area, pastured dairy cows on 77 acres and other livestock on an additional area of 47.6 acres. The Fairmont farms pastured dairy cows on 67 acres and other livestock on 8.6 acres out of an average total area per farm of 106.8 acres.

Crop land was used mostly for hay and corn, although a few Morgantown farms raised appreciable amounts of oats and wheat. Morgantown farms had an average of 43.9 acres per farm in crops. Hay occupied 24.3 acres of this, or more than half. On the remaining 19.6 acres of crop land the principal crops were corn, grown on 9.2 acres, and oats and wheat, raised on about equal areas, 2.6 and 2.9 acres respectively per farm. Fairmont farms had 25.4 acres of crop land per farm, the most important crops being hay, grown on 18 acres, and corn, grown on 6.4 acres (Table 4).

The relative amounts of land devoted to legume and non-legume hays indicates the amounts of such hays available for feeding. The value of feeding legume hay will be discussed later (pp. 25 and 26). On Morgantown farms 5.1% of the total farm acreage was in legume hay; 8.0% in non-legumes. Fairmont farms devoted only 3.5% of their total farm acreage to legumes and 13.4% to non-legumes.

TABLE 4—*Utilization of land area on farms in the study (1934)*

ITEM	24 Morgantown Farms		27 Fairmont Farms	
	Acres	Percent of Total Area	Acres	Percent of Total Area
Corn, for grain	3.2	1.7	4.6	4.3
Corn, for silage	6.0	3.3	1.8	1.7
Oats	2.6	1.4	..	..
Wheat	2.9	1.6	.3	.3
Buckwheat	1.0	.5	..	..
Potatoes	.5	.3	..	..
Legume hay	9.5	5.1	3.7	3.5
Non-legume hay	14.8	8.0	14.3	13.4
Other crops	3.4	1.9	.7	.6
Total crop land	43.9	23.8	25.4	23.8
Orchard	.8	.4	.7	.6
Dairy pasture	77.0	41.8	67.0	62.7
Other pasture	47.6	25.8	8.6	8.1
Woods	12.6	6.9	3.2	3.0
Waste	.7	.4	.3	.3
Farmstead	1.7	.9	1.6	1.5
TOTAL	184.3	100.0	106.8	100.0

Crop yields The crop yields shown in Table 5 indicate the productivity of the farms in the study. Corn yielded 40.6 bushels per acre in the Morgantown area and 32.8 bushels per acre in the Fairmont area, and yields of silage were 8.8 and 9.6 tons. The oat and wheat crops were less than expected because of the effects of drought. On the Morgantown farms oats averaged 34.2 and wheat, 22.1 bushels. No oats were raised for grain on any Fairmont farms in the study, and wheat was grown on only one farm, where a yield of 20.9 bushels was obtained.

Hay yields were affected by drought also, timothy yielding an average of 0.8 ton on Morgantown farms, and 0.9 ton on Fairmont farms, alfalfa yielding 1.8 and 1.6 tons, respectively, and mixed clover and timothy giving yields of 0.9 and 1.0 tons. Soybeans yielded 1.2 tons on Morgantown farms, and 1.5 tons in Fairmont. Oat hay, which was grown in small amounts by more than one-third of the

farms studied, was most severely affected by the dry weather, yielding 0.7 ton on the Morgantown farms, and 0.3 ton on Fairmont farms.

The foregoing information is presented with the purpose of describing the agricultural conditions under which the dairy enterprise is conducted in these two markets. The size of farms, the use which was made of the land, the crops and crop yields, the kind and amounts of other livestock kept — all emphasize the idea that dairy farms in these areas are specialized. They are handicapped by being unsuited to the raising of concentrates yet are favored with plenty of pasture land and with satisfactory yields of those crops that can be grown.

TABLE 5—*Average crop yields on farms in the study (1934)*

Crop		24 Morgantown Farms	27 Fairmont Farms
		Yield	Yield
Corn	bushels	40.6	32.8
Silage	tons	8.8	9.6
Oats	bushels	34.2	...
Wheat	"	22.1	20.9
Buckwheat	"	25.6	...
Potatoes	"	193.4	...
Timothy	tons	.8	.9
Red clover	"	1.1	...
Mixed clover and timothy	"	.9	1.0
Alfalfa	"	1.8	1.6
Soybeans	"	1.2	1.5
Sorghum cane	"	2.3	2.3
Oat hay	"	.7	.3
Wheat hay	"	...	1.0

TABLE 6—*Average value of some factors in the cost of producing milk in the Morgantown and Fairmont markets (1934-1935)*

ITEM		Morgantown	Fairmont
Concentrates	per 100 lbs.	$ 1.85	$ 1.88
Hay	per ton	20.33	22.11
Silage	per ton	6.25	6.50
Pasture—per cow per month		1.77	1.63
Labor—per hour		.17	.15

EXPLANATION OF CREDITS AND ITEMS OF COST

Average prices and variations The average rates charged for some of the items of expense are given in Table 6. The price paid for ready-mixed concentrates varied widely during the year. During the first few months of the study, 24% dairy ration sold as low as $1.55 per 100 pounds. During the summer and fall, prices advanced until 24% dairy ration sold at $2.25 and $2.30 through December and January, after which it dropped in price somewhat. Hay prices took a slightly different course. Alfalfa hay sold for $15 to $16 per ton delivered at Morgantown farms during the spring of 1934. After the hay crop was harvested the price of alfalfa delivered

at Morgantown farms became settled near $22 a ton, from which it rose slowly to $25 or $26 in February and March. The cost of hay in Fairmont was two to four dollars higher than the cost of hay of similar quality in Morgantown.

Rules followed in charging costs Feed raised on the farm was valued as nearly as possible at the price it could be sold for at the farm. Silage was taken to be one-third the value of timothy hay. Purchased feeds were charged at their cost at the farm. Pasture was charged at the prevalent local rates for rented pasturage.

Hired labor was charged at its actual cost. Operator's and unpaid family labor was charged at the average rate paid for hired help on the farms studied, no increase being allowed for management.

Depreciation of cows was obtained by subtracting the ending inventory, sales, and losses from the beginning inventory, purchases, and value of heifers freshening. In some cases where the ending inventory etc. was larger, the increase was credited as appreciation. Depreciation of buildings was charged at 4% of their value in the beginning inventory. The remaining charges for use of buildings are included in interest on investment and other costs. Depreciation of equipment was taken as the decrease in equipment inventory.

Interest at the rate of 5% was charged on the average investment in cows, buildings, and equipment. "Other costs" include taxes, bedding, veterinary expense, repairs, and electricity and heat.

Credits The credits other than milk include the value of manure and calves produced, and appreciation or increase in value of cows. The value of manure produced was based on the market value of fertilizing constituents estimated to be contained in the feed fed. The amounts of nitrogen, phosphorus, and potassium were estimated by use of average analyses reported by Henry and Morrison.* Eighty percent of the fertilizing constituents fed were considered to be excreted, as those authors suggest. Calves were valued at $1 when kept to be raised and at their selling price when sold.

For those farms which retailed their own milk, the problem arose as to where production costs stop and distribution costs begin. For the purposes of this study it was decided that production costs should include all material, investment, and labor involved up to the time the milk was passed over the cooler. On farms which sold their milk to distributing plants the cost included all those up to the time the cans of milk were placed at the roadside to be taken away by the hauler. Hauling costs therefore are not included as a cost of production. These were also deducted from the price received by farmers in calculating returns.

*Henry, W. A., & Morrison, F. B. Feeds and Feeding. Appendix, Table I, 19th edition, 1928.

COST OF PRODUCTION PER COW ON MORGANTOWN FARMS

The average cost of keeping a cow a year on the Morgantown farms was $125.14. The lowest cost was $94.64, the highest cost $163.15. This variation was associated very largely with the average production per cow, the coefficient of correlation between cost of keeping a cow and production per cow being .5839. However, the variation in total cost does not tell a great deal about the management of the herds studied. Instead, it is by studying the separate items of cost that the management methods used in the market can be shown.

Production The costs presented in Tables 7 and 8 have been arranged according to the average production of 4% milk per cow. This production ranged from 3,962 pounds in the lowest herd to 7,412 pounds in the highest herd. The average production of all cows in the Morgantown market was 5,823 pounds of 4% milk. With production per cow being such an important factor in the cost of producing 100 pounds of milk, it appears that much could be done to lower costs of milk production by developing herds of higher producing ability.

Feed cost The cost of feed made up 60% of the total cost of keeping a cow. It averaged $74.80, as compared with an average total cost of $125.14. The range of feed costs, $54.23 to $103.62, was due partly to differences in production, but to some extent it depended on the kind and amount of feed fed. During the time when the data were being gathered, some observations were made of the methods of feeding. Later, when the results were summarized it was found that the lowest feed cost had been obtained in herds fed mainly on roughage, with small amounts of concentrates. Herds having the very high feed costs were those which were fed indifferent quality and limited amounts of roughage, with liberal amounts of concentrates. The practices which resulted in most economical production, however, consisted in feeding concentrates in amounts proportionate to milk production, and sufficient amounts of good quality roughage based on the weights of the cows.

Labor Next to feed, the largest item of cost was labor. The amount of labor required depended much on the size of the herd and whether or not a milking machine was used. These factors will be discussed later. It will suffice here to show that the range was considerable. The average amount of time spent per cow in all herds was 145 hours, but the lowest in any herd was 78 hours, while the highest was 248. The extremes of cost occurred also in the same two herds having the extreme hours of labor and were $12.80 and $42.16. The average cost of labor in all herds was $24.74.

Depreciation costs Value of cows appreciated in several herds, but where depreciation occurred, the cost per cow ranged up to $14.25 and averaged $3.28 for all herds. The higher depreciation was formed in herds in which many cows were replaced during the year. Where the majority of the cows in the herd were young and replacements made with heifers raised, there tended to be net appreciation. As the value of cows increases, the depreciation tends to be larger also.

Depreciation of buildings averaged $4.89 per cow per year, and varied within limits of $1.53 to $11.15. Many buildings were of such construction that they could not be used if present sanitation requirements for producing milk were to be raised. In most cases the use of such buildings was accompanied by low building depreciation, and if improved buildings had to be put in their place, the cost of producing milk would have risen accordingly. Buildings embodying the most desirable features of dairy-barn construction resulted in depreciation costs higher than average, no matter how efficiently they were utilized.

Equipment depreciation varied from 23c to $3.72 per cow, averaging $1.56. This must be considered along with the expenditures for supplies and equipment when comparing individual farms. Small purchases of such equipment as milk cans and pails, brooms, and shovels were counted as cash expenses but were included in the final inventory, thereby causing the depreciation to appear to be less than its true amount. The difference was contained in the expenses for supplies and equipment.

Supplies etc. Cash expenses for supplies and equipment ranged from nothing to $4.88. The lower equipment costs occurred in small herds, where less equipment was used and, in some cases, in herds which did not make use of some equipment and supplies desirable for the production of high-quality milk. Large herds had lower costs because their size enabled them to make the most efficient use of adequate equipment and supplies.

Bull costs Bull costs varied from 11c to $5.57 per cow. It is probable that costs above the average, $2.57, are more consistent with good management than in the case of any other item, although large herds, because of the number of cows, received the service of better-than-average bulls at less-than-average cost per cow. The cost of bull service at its highest was less than four percent of the total cost of keeping a cow. In view of this fact, and in view of the influence of a good bull on the producing ability of his daughters, it seems that an increase in bull costs per cow through the use of better bulls in the long run would be very profitable.

TABLE 7—*Cost of keeping a cow on farms in the Morgantown market (April 1, 1934 - March 31, 1935)*

Farm No.	Lbs. of 4% milk-equivalent per cow	Feed and pasture	LABOR		DEPRECIATION			Bull costs	Supplies and equipment	Interest on investment	Other costs	Total
			Hours	Value	Cows	Buildings	Equipment					
16	7,412	$ 88.68	195	$31.25	$ ...	$ 6.41	$ .61	$ .73	$ .42	$11.72	$3.85	$143.67
1	7,350	80.21	189	33.13	...	1.53	2.52	.11	1.69	7.09	2.16	128.43
23	7,293	95.65	178	30.30	3.39	7.79	3.05	1.43	3.77	14.30	3.47	163.15
2	6,924	69.69	177	28.89	...	4.77	.58	2.70	.37	6.68	2.20	115.89
24	6,854	88.02	179	34.92	.98	8.27	1.39	1.07	.41	14.57	1.95	151.58
18	6,823	78.59	123	27.06	8.92	1.65	1.43	3.24	.99	4.85	1.29	128.01
5	6,748	101.11	121	20.55	...	5.41	1.71	2.90	1.92	10.20	3.48	147.28
10	6,701	74.35	248	42.16	3.50	2.55	.61	1.23	1.63	5.50	1.45	132.98
9	6,644	90.76	106	11.80	2.77	11.15	2.17	3.34	1.49	17.20	4.47	145.13
6	6,390	86.49	173	25.58	2.32	6.02	3.72	4.97	.78	13.24	1.97	145.12
22	6,367	72.26	149	25.34	2.68	7.57	1.26	2.00	.73	11.95	1.17	124.95
8	6,334	78.13	203	36.56	...	3.06	2.00	.88	.65	4.74	.70	126.72
3	6,303	87.35	118	19.50	1.02	6.81	.89	2.23	1.52	11.97	2.02	133.31
4	6,220	62.87	158	25.63	14.25	5.36	.23	2.89	4.88	11.33	5.44	132.88
15	5,988	103.62	135	22.94	2.00	3.54	.51	5.57	.22	8.41	3.10	149.91
19	5,368	79.80	96	17.81	6.67	2.18	1.28	3.25	2.14	6.73	1.91	121.78
14	5,243	68.41	198	33.69	...	9.13	.39	1.30	.20	12.26	2.39	127.76
17	5,150	54.23	124	20.11	4.67	3.08	3.37	4.33	1.45	9.36	1.26	101.86
20	4,851	54.37	145	24.61	5.41	2.41	1.32	1.66	1.25	6.14	2.89	100.06
12	4,702	69.46	167	27.19	3.94	4.70	.25	3.74	...	8.04	1.87	119.20
21	4,529	59.40	235	39.88	2.07	4.67	.62	1.89	.41	8.89	1.75	119.59
11	4,324	54.49	78	12.80	2.03	6.25	1.03	1.62	1.46	11.26	3.71	94.64
7	4,260	62.86	163	26.01	.52	2.72	.34	.56	.12	5.74	1.19	100.04
13	3,962	60.18	143	21.32	4.90	4.33	2.34	3.50	1.20	7.56	4.50	109.82
Average	5,823	74.80	145	24.74	3.28	4.89	1.56	2.57	1.24	9.65	2.40	125.14

TABLE 8—*Milk produced per cow, total cost, and returns on farms in the Morgantown market (April 1, 1934 - March 31, 1935)*

Farm No.	PRODUCTION				Total cost	Credits Other Than Milk					Net cost	Returns for milk produced	Profit or loss
	Lbs. 4% milk equivalent	Lbs. milk	% Fat	Lbs. Fat		Manure	Calves	Appreciation	Feed sacks	Total			
16	7,412	7,296	4.1	299	$143.67	$11.70	$ .49	$ 1.34	$...	$13.53	$130.14	$101.62	—$28.52
1	7,350	6,966	4.4	304	128.43	13.29	4.24	5.18	...	22.71	105.72	117.35	11.63
23	7,293	6,931	4.4	301	163.15	14.96	1.42	...	...	16.38	146.77	99.78	— 46.99
2	6,924	6,819	4.1	279	115.89	9.65	.95	10.12	...	20.72	95.17	81.24	— 13.93
24	6,854	6,413	4.5	285	151.58	17.51	.32	...	...	17.83	133.75	130.82	— 2.93
18	6,823	6,668	4.2	277	128.01	13.33	1.06	...	...	14.39	113.62	181.05	67.43
5	6,748	7,114	3.7	260	147.28	15.75	.82	1.34	...	17.91	129.37	103.79	— 25.58
10	6,701	6,421	4.3	275	132.98	10.62	2.90	...	...	13.52	119.46	125.46	6.00
9	6,644	6,824	3.8	261	145.13	14.53	.78	...	...	15.31	129.82	161.52	31.70
6	6,390	5,848	4.6	270	145.12	15.70	.19	...	...	15.89	129.23	119.31	— 9.92
22	6,367	6,313	4.1	256	124.95	13.77	1.75	...	...	15.52	109.43	128.79	19.36
8	6,334	5,728	4.7	269	126.72	9.88	1.16	...	.01	11.05	115.67	113.70	— 1.97
3	6,303	7,000	3.3	233	133.31	10.93	1.18	...	...	12.11	121.20	153.87	32.67
4	6,220	6,147	4.1	250	132.88	12.19	.62	...	...	12.81	120.07	92.25	— 27.82
15	5,988	6,807	3.2	217	149.91	18.17	.36	...	.92	19.45	130.46	141.81	11.35
19	5,368	5,853	3.4	201	121.78	11.76	.68	...	...	12.44	109.34	136.13	26.79
14	5,243	5,368	3.8	206	127.76	8.48	.62	1.56	...	10.66	117.10	68.66	— 48.44
17	5,150	4,539	4.9	222	101.86	7.29	.72	...	...	8.01	93.85	109.68	15.83
20	4,851	5,310	3.4	181	100.06	8.87	1.09	...	...	9.96	90.10	115.42	25.32
12	4,702	4,441	4.4	195	119.20	9.89	.67	...	...	10.56	108.64	81.41	— 27.23
21	4,529	4,626	3.9	178	119.59	10.48	.47	...	...	10.95	108.64	64.75	— 43.89
11	4,324	4,811	3.4	161	94.64	9.10	.99	...	.27	10.36	84.28	118.77	33.49
7	4,260	4,288	4.0	169	100.04	7.67	.21	...	...	7.88	92.16	58.83	— 33.33
13	3,962	3,900	4.1	160	109.82	7.59	2.32	...	...	9.91	99.91	82.95	— 16.96
Ave.	5,823	5,830	4.0	232	125.14	11.72	.98	.54	.05	13.29	111.85	118.63	6.78

Interest on investment Next to feed and labor the largest item of cost was interest on investment. In this item, again, it is probable that costs above the average are consistent with the best management. The value of cows, which in the long run, must be high or low according to their producing ability, accounted for about one fourth of the total investment. Buildings and equipment designed to favor economical production call for considerable outlays, and accounted for most of the remaining investment. The amount of interest charged varied from $4.74 to $17.20 per cow. The average was $9.65 and represents an average investment per cow of $193.00. Of this, $50.90 was the value of the cow, $116.62 the per-cow value of buildings, $18.06 the value of equipment per cow, and $7.42 the average inventory value of feed.

Other costs Other costs ranged from 70c to $5.44 per cow. The average cost, $2.40 per cow, was made up of 52c for bedding, 24c for repairs, 87c for taxes, 18c for veterinary expenses, and 59c for electricity and heat.

Credits and net returns The total cost of keeping a cow is not to be taken as the cost of the milk she produced, since the manure and calf have some value also. In some cases the average cow in the herd was worth more at the end of the year than at the beginning, and it was necessary to credit her with the increase. Feed purchased during the year resulted in an accumulation of feed sacks. In case these were sold, their value was credited to the cow. In the Morgantown market the average cow was credited with $11.72 worth of manure, 98c per cow for calves raised or sold, 54c for appreciation, and 5c for feed sacks sold. The total of these credits was $13.29. The average total cost per cow was $125.14, and subtracting miscellaneous credits of $13.29 left $111.85 as the net cost of the milk produced per cow. The total value of milk sold and used on the farms was $118.63 per cow, so that the profit of keeping a cow a year amounted to $6.78. This may be expressed as a return per hour for all labor of 22c, instead of 17c plus a profit of $6.78 per year.

The average production, costs, returns, and profits per cow for each of the Morgantown herds in the study are shown in Tables 7 and 8.

COST OF PRODUCTION PER COW ON FAIRMONT FARMS

Production The costs of keeping a cow in different herds in the Fairmont market are arranged in Tables 9 and 10 according to the production of 4% milk per cow, as were the costs of the Morgantown herds. Average production of herds in the Fairmont market ranged from 2,193 pounds to 7,052 pounds. The average production of 4% milk for all cows was 5,080 pounds. The main cause of the low production found in these Fairmont herds in some cases was low producing ability, in other cases insufficient feed. The lower producing herds sustained the greatest losses per 100 pounds of milk

sold, so that high production per cow appears to be essential to low-cost production.

Feed Costs The average total costs were lower in Fairmont than in Morgantown. The average total cost of keeping a cow a year in all Fairmont herds was $109.26. The lowest cost was $49.66, while the highest cost ran up to $173.82. The reasons for this variation are shown in the various items of cost.

Feed costs ranged from $34.79 to $105.95, and the average was $67.94. The herds which had the lowest feed cost fed poor-quality roughage and an insignificant amount of grain. The grain fed was mostly home grown. Since the roughage was mostly native hay and stover, there was a lack of protein and possibly of minerals. The practices which caused herds to have the higher feed costs per cow were: (1) feeding too much grain for the amount of milk produced, and (2) having to feed roughage over too long a season because of poor or insufficient pasture.

Labor The amount of labor per cow varied from 85 to 296 hours and depended on the size of the herd as well as on the ability of the operator to make efficient use of his time. The average time per cow for all herds was 151 hours, which compares very closely with the 145 hours required in the Morgantown market. In only one herd was a milking machine used during the entire year. The cost of labor on Fairmont farms was $22.95 less than in Morgantown herds because the average cost of hired labor was lower on the farms in the Fairmont area. The average cost per cow by individual herds varied from $10.05 to $38.99.

Depreciation costs Depreciation per cow averaged $3.15 for all herds. It was unusually high in some because of forced sales where efforts were made to eradicate Bang's disease, and high in other herds that attempted to maintain high-producing herds by selling dry cows and buying fresh ones.

Building depreciation varied from 46c to $7.70 per cow, the average being $3.22. This average should be considered a minimum, since several barns were of such poor construction that they did not provide proper comfort or convenience in the management of the herd. Furthermore, they provided such a bare margin over the minimum requirements of the local milk ordinance that if any stricter ordinance were put into effect, new buildings would become necessary. The result would be an increase in the cost of production.

Supplies etc. Equipment depreciated from 14c to $2.88 per cow, or an average of 60c, and the expense for equipment and supplies ranged from nothing to $6.40, averaging 97c. The lower cost of this item in Fairmont than in the Morgantown market is due to lesser requirements for sanitary supplies, less use of milking machines, and less adequately equipped barns.

TABLE 9—*Cost of keeping a cow on farms in the Fairmont market (May 1, 1934 - April 30, 1935)*

Farm No.	Lbs. of 4% milk-equivalent per cow	Feed and pasture	LABOR		DEPRECIATION			Bull costs	Supplies and equipment	Interest on investment	Other costs	Total
			Hours	Value	Cows	Buildings	Equipment					
25	7,052	$105.95	296	$37.54	$ 1.25	$7.70	$ .28	$8.32	$ ...	$11.31	$1.48	$173.82
6	6,917	81.31	164	22.57	.52	5.59	.69	1.82	1.20	9.37	1.18	124.25
22	6,841	79.90	256	38.99	3.39	4.52	.23	.90	.74	6.99	1.18	136.84
5	6,320	80.09	120	19.12	4.23	5.35	.37	1.20	.47	8.13	1.00	119.96
26	6,020	69.12	155	26.94	...	3.30	1.86	6.43	6.40	6.79	3.34	124.18
19	5,887	71.40	133	22.35	13.06	3.82	.30	1.00	.80	7.69	4.70	125.13
10	5,822	86.00	215	32.86	...	.86	.47	1.79	.45	3.01	2.85	128.28
4	5,689	63.61	163	31.24	7.45	1.97	.28	1.26	.70	4.22	.64	111.39
23	5,661	84.33	144	20.86	5.00	3.70	.30	3.07	1.41	6.90	5.92	131.53
13	5,657	39.56	252	38.43	...	1.65	.78	...	...	2.15	1.91	84.48
20	5,573	48.12	184	28.06	4.87	5.39	.41	.97	.51	7.89	1.23	97.46
11	5,537	88.49	196	28.27	...	.58	.25	1.89	.57	2.85	5.22	128.13
15	5,430	68.48	162	25.68	3.40	7.56	.17	1.70	.72	11.47	3.52	122.68
3	5,163	81.22	156	22.14	3.11	.96	.14	2.15	.44	2.74	.37	113.25
1	4,943	61.85	150	22.83	4.60	4.67	1.29	1.29	.81	8.79	1.23	107.38
12	4,703	60.77	173	26.44	...	2.27	.19	.25	.63	6.16	2.65	98.37
8	4,691	50.66	159	22.03	11.76	2.76	.90	.91	.24	5.45	2.13	96.82
21	4,518	65.71	149	19.55	...	.99	.14	.91	.06	2.70	.32	90.36
16	4,492	55.51	114	17.40	...	3.08	2.88	.32	1.93	6.83	5.54	93.50
24	4,448	66.77	202	30.75	4.55	2.53	.76	4.38	.40	5.24	1.09	116.47
17	4,273	49.76	171	26.05	1.47	4.03	1.30	8.17	.94	13.65	2.16	107.55
2	4,210	75.81	136	21.63	2.36	4.94	.87	2.56	.15	9.74	1.42	119.46
27	4,053	66.44	109	12.89	...	.46	.54	1.30	1.55	2.69	.59	86.46
18	4,010	52.57	136	20.66	...	2.02	.36	1.77	.48	4.95	1.62	84.44
7	3,743	55.64	120	18.32	...	2.44	.24	.67	...	4.50	1.41	83.23
14	3,132	70.58	126	19.17	.64	2.44	.35	.42	.02	4.89	1.65	100.17
9	2,193	34.79	85	10.05	.25	.65	.51	.34	...	2.21	.85	49.66
Average	5,080	67.94	151	22.95	3.15	3.22	.60	2.00	.97	6.29	2.16	109.26

TABLE 10—*Milk produced per cow, total cost, and returns on farms in the Fairmont market (May 1, 1934 - April 30, 1935)*

Farm No.	PRODUCTION				Total cost	Credits Other Than Milk					Net cost	Returns for milk produced	Profit or loss
	Lbs. 4% milk equivalent	Lbs. milk	% Fat	Lbs. Fat		Manure	Calves	Appreciation	Feed sacks	Total			
25	7,052	6,507	4.6	296	$173.82	$13.26	$ ...	$ ...	$ ...	$13.26	$142.34	$100.42	—$41.92
6	6,917	6,597	4.3	285	124.25	13.93	.36	...	...	14.29	109.96	98.43	— 11.53
22	6,841	6,672	4.2	278	136.84	13.91	...	...	...	13.91	122.93	158.31	36.38
5	6,320	6,121	4.2	258	119.96	12.64	...	...	...	12.64	107.32	97.42	— 9.90
26	6,020	6,191	3.8	236	124.18	8.71	.99	.12	.07	9.89	114.29	99.49	— 14.80
19	5,887	5,545	4.4	244	125.13	10.55	.05	...	...	10.60	114.53	111.81	— 2.72
10	5,822	5,317	4.6	246	128.28	21.42	1.54	1.92	.72	25.60	102.68	95.46	— 7.22
4	5,689	5,335	4.4	237	111.39	8.27	1.62	...	...	9.89	101.50	86.69	— 14.81
23	5,661	5,290	4.5	236	131.53	17.74	.30	...	...	18.04	113.49	91.51	— 21.98
13	5,657	5,248	4.5	237	84.48	5.40	...	22.19	...	27.59	56.89	91.74	34.85
20	5,573	4,985	4.8	238	97.46	7.51	...	...	...	7.51	89.95	82.37	— 7.58
11	5,537	4,939	4.8	237	128.13	14.27	2.40	1.02	.90	18.59	109.54	79.60	— 29.94
15	5,430	4,991	4.6	228	122.68	10.16	1.78	...	...	11.94	110.74	86.83	— 23.91
3	5,163	4,507	5.0	224	113.25	12.30	.48	...	...	12.78	100.47	75.53	— 24.64
1	4,943	4,516	4.6	209	107.38	9.43	...	...	...	9.43	97.95	76.89	— 21.06
12	4,703	4.516	4.3	193	98.37	7.00	.25	.95	...	8.20	90.17	83.35	— 6.82
8	4,691	4,433	4.4	194	96.82	5.58	3.37	...	...	8.95	87.87	50.33	— 37.54
21	4,518	4,132	4.6	191	90.36	9.11	1.04	.07	...	10.22	80.14	70.70	— 9.44
16	4,492	3,951	4.9	194	93.50	4.85	.15	4,23	...	9.23	84.27	61.20	— 23.07
24	4,448	4,122	4.5	186	116.47	7.67	.51	...	...	8.18	108.29	70.21	— 38.08
17	4,273	3,977	4.5	178	107.55	6.62	.98	...	...	7.60	99.95	78.54	— 21.41
2	4,210	4,267	3.9	166	119.46	10.18	...	...	...	10.18	109.28	72.65	— 36.63
27	4,053	4,189	3.8	158	86.46	9.61	4.22	1.35	.15	15.33	66.30	62.22	— 4.08
18	4,010	3,593	4.8	171	84.44	7.27	.29	.51	...	8.07	76.37	55.83	— 20.54
7	3,743	3,570	4.3	154	83.23	8.11	4.13	.12	...	12.36	70.87	55.44	— 15.43
14	3,132	2,996	4.3	128	100.17	10.24	2.54	...	...	12.78	87.39	46.04	— 41.35
9	2,193	2,164	4.1	88	49.66	5.75	...	...	...	5.75	43.91	33.38	— 10.53
Ave.	5,080	4,788	4.4	211	109.26	10.10	1.12	.53	.05	11.80	96.79	80.48	— 16.31

Bull costs One small herd did not use any bull service during the year, producing cows being kept on hand by purchase of fresh cows. Among the other herds the cost of bull service ranged from 25c to $8.32 per cow, the average cost being $2.00. From the low production achieved by herds in this market it certainly would be advisable to use more good registered bulls. The cost of bull service might then be greater than at present, but it would be justified by the resulting increase of production.

Interest on investment The average interest on investment per cow in the Fairmont market was $6.29. This represents a total investment of $125.80, of which $37.68 was in the cow herself, $75.71 her share of the investment in buildings, $6.03 the per-cow investment in equipment, and $6.38 the average value of feed on hand May 1.

It is not necessarily a good indication that the investment on the Fairmont farms was low. Good producing cows would have required a larger investment, as would more adequate buildings. Better cows would be a profitable investment. The amount invested in buildings perhaps should depend on the quality of milk demanded by distributors or consumers and on the price that the dairyman receives.

Other costs Other costs ranged from 32c to $5.92 per cow, averaging $2.16. They include charges of 79c for repairs, 7c for veterinary expense, 72c for taxes, 16c for electricity, and 42c on deductions made from sales through the Dairymen's Cooperative Sales.

Those dairymen who sold milk through Dairymen's Cooperative Sales were subject to costs of 2c for each 100 pounds of milk sold through the association, and for several months an additional 2c per 100 pounds was deducted to maintain a check tester in the plant receiving their milk.

Credits and returns Besides milk the average cow produced manure worth $10.10, a calf worth $1.12, and was credited with appreciation of 53c and feed sacks sold for 5c. The total of these receipts averaged $11.80 each for all cows in the Fairmont herds. The total cost of keeping a cow was $109.26. Subtracting from this the receipts other than milk left a net cost of producing milk of $96.79 per cow. Milk worth $80.48 was used and sold from each cow. Thus a net loss of $16.31 per cow was suffered by producers in the Fairmont market. This represents a return of only 4c per hour for all labor instead of the 15c charged as cost.

The average production, costs, returns, and profits per cow for all the Fairmont herds in this study are shown in Tables 9 and 10.

Amounts and kinds of concentrates fed

Some herds were fed one kind of grain only, and no one herd received all the kinds of feeds used in the area. The following mixtures therefore are averages for the two areas, and not typical mixtures. The concentrate most commonly used in the Morgantown area was ready-mixed feed containing 24% of crude protein. Of every 100 pounds of feed fed, 43 pounds were of a 24% protein mixture. Mixed feeds containing 16% protein made up 20 pounds of each 100 pounds of feed. Eleven pounds of each 100 were 18% ready-mixed feed, and 10% feeds (usually known as "chop") made up 10 pounds of each 100 pounds. The remaining 16 pounds per 100 included three pounds each of corn-and-cob meal, wheat bran, and 20% mixed feed, and seven pounds of miscellaneous concentrates.

Among the Fairmont herds the most common feed was the 16% mixed feed, of which there were fed 29 pounds per 100 pounds of grain fed. There were fed also 24 pounds of 24% mixtures, and 22 pounds of 20% mixtures. Corn-and-cob meal made up 10 pounds of each 100. The remaining 15 pounds included 6 pounds of wheat bran, three pounds of chop, and 6 pounds of other concentrates. If it is assumed that feeding costs remain the same, the average cost of concentrates for each of the market areas can be calculated at any time from the prices of the different grains used by using the average percentages given above. The average grain mixtures for the two markets are shown also in Table 11.

TABLE 11—*Relative amount of various kinds of grain fed*

Kind of grain	Lbs. in 100 lbs. of grain fed	
	Morgantown	Fairmont
Corn (ground with cob)	3	10
Wheat bran	3	6
Mixed feeds:		
10% protein (chop)	10	3
16% " "	20	29
18% " "	11	..
20% " "	3	22
24% " "	43	24
Other feeds	7	6
TOTAL	100	100

The quantities of feed and labor used for milk production were arrived at by averaging the quantities used by all the herds in each market. The amounts of grain fed, to a great extent, depended on the amount of milk produced. Morgantown cows were fed 1,463 pounds of grain per cow in producing 5,823 pounds of 4% milk, or one pound of grain for each 4.0 pounds of 4% milk, and Fairmont cows were fed 1,318 pounds of grain in producing 5,080 pounds of 4% milk, or one pound of grain for each 3.9 pounds of 4% milk.

Amounts and kinds of roughages fed The amount of roughage fed depended mostly on the size of cow and on the length of feeding season. Morgantown cows received the equivalent of 3,837 pounds of dry roughage per cow (considering three pounds of silage to be equal to one pound of dry roughage). The average weight of cows in that area was 971 pounds, and they were barn-fed 170 days. Fairmont cows, averaging 891 pounds in weight, were barn-fed only 156 days. They received each the equivalent of 3,310 pounds of dry roughage.

Hay in the amount of 2,278 pounds was included in the 3,837 pounds of roughage equivalent fed to Morgantown cows. Alfalfa, soybean, and clover hay made up 42% of all hay fed, the remainder being timothy, mixed, and native hay. An average of 4,050 pounds of silage was fed per cow, equivalent to 1,350 pounds of dry roughage. The remaining other roughage was straw and stover, which was fed on just five of the farms studied but amounted to 209 pounds per cow for the area.

Fairmont cows received 2,276 pounds of hay in their 3,310 pounds of dry roughage. Thirty percent of this was alfalfa, soybeans, and clover. The amount of silage fed per cow was 1,513 pounds equivalent to 504 pounds of dry roughage. Corn stover was fed on 16 Fairmont farms and straw on one, the average amount of stover and straw being 530 pounds per cow for all cows.

Labor The hours of labor required per cow were 145 in the Morgantown market and 151 in the Fairmont market.

Computing costs of milk production at changing price levels The foregoing quantities of feed and labor may be used as a basis for computing costs of producing milk when prices differ from what they were during 1934-35. Changing price levels do not greatly affect the interest on investment, building charges, etc. For several years to come, therefore, it is probable that the costs for items other than feed and labor will remain near the 1934-35 level. Adding the 1934 costs of items other than feed and labor to the esti mate of current feed and labor costs based on current prices should give a usable estimate of the total costs of producing milk at any time. The quantities of feed and labor used are shown in Table 12.

COST PER HUNDREDWEIGHT OF MILK

Reason for using 4% milk-equivalent In the following discussion production is given in terms of 4% milk. Cows secreting 4% milk will produce fewer pounds of milk from a given amount of feed than will cows secreting 3% milk, and more than will cows producing 5% milk. It would be misleading for costs based on a given production of low-test milk to be compared with costs based on the same amount of high-test milk. Therefore the actual amount of milk produced in herds in this study was converted to an amount

of milk containing 4% fat, and an equivalent amount of energy, by using the formula*:

(Pounds of milk × 0.4) plus (pounds of fat × 15) = pounds of 4% milk.

By using this method of conversion the cost of production based on actual production of 3% milk was lower by 29c per cwt. than when the cost was based on the amount of 4% milk equivalent. Milk containing 5% fat cost 29c per cwt. more than its 4% equivalent.

TABLE 12—*Amounts of feed and labor used in producing milk in the Morgantown and Fairmont markets (1934-1935)*

ITEM	Per cow		Per 100 lbs. milk	
	Morgantown	Fairmont	Morgantown	Fairmont
Average production	5,823 (lbs. milk)	5,080	..	..
Concentrates (lbs.)	1,463	1,318	25	26
Hay (lbs.)	2,278	2,276	39	45
Silage (lbs.)	4,050	1,513	70	30
Other roughage (lbs.)	209	530	4	10
Pasture days	195	209	3.3	4.1
Man labor (hrs.)	145	151	2.5	3.0
Percentage of total cost contributed by above factors	....	....	79.6	83.1

Effect of production Cost per 100 pounds of milk was shown to be affected greatly by the amount of milk produced per cow. In Table 7, for example, herd no. 13 was shown to have an average cost per cow considerably below the average cost for all herds, yet, because of the low production per cow of only 3,962 pounds, the cost of producing 100 pounds of milk (Table 13) was higher than in any other herd.

Net cost and returns—Morgantown The net cost of producing milk in the Morgantown market ranged from $1.37 per 100 pounds to $2.52 and averaged $1.92. The value of milk used and sold ranged from $1.17 to $2.75 and averaged $2.04. One group of producers had a price advantage because of favorable contracts with distributors. There were 8 herds in this group. The value of milk used and sold by them was $2.43 per 100 pounds. Their average net cost of production was $1.95, leaving an average profit of 48c per 100 pounds of milk or a return of 39c per hour of labor. The 14 producers who did not have the price advantage received an average price of $1.69 per 100 pounds of milk produced. Their costs averaged $1.89 per 100, resulting in a loss of 20c or a reduction of labor returns to 10c per hour. These costs and returns are shown for individual herds in Table 13.

*Gaines, W. L., and Davidson, F. A. Relation Between Percentage Fat Content and Yield of Milk. Ill. Agr. Exp. Sta. Bul. 245, p. 594. 1923.

TABLE 13—*Cost of producing 100 pounds of milk on farms studied in the Morgantown market (one year ending March 31, 1935)*

Farm No.	Pounds of 4% milk produced per cow	COST PER 100 POUNDS OF 4% MILK														
		Feed and pasture	LABOR		DEPRECIATION			Bull costs	Supplies and equipment	Interest on investment	Other costs	Total	Credits other than milk	Net cost	Value of milk sold & used on farm	Returns per hour of labor
			Hrs.	Value	Cows	Buildings	Equipment									
16	7,412	$1.19	2.6	$.42	$..	$.09	$.01	$.01	$.01	$.16	$.05	$1.94	$.18	$1.76	$1.37	$ .01
1	7,350	1.10	2.6	.45	..	.02	.03	..	.02	.10	.03	1.75	.31	1.44	1.60	.11
23	7,293	1.31	2.4	.41	.05	.11	.04	.02	.05	.20	.05	2.24	.23	2.01	1.37	—.10
2	6,924	1.00	2.6	.41	..	.07	.01	.04	.01	.10	.03	1.67	.30	1.37	1.17	.08
24	6,854	1.28	2.6	.51	.01	.12	.02	.02	.01	.21	.03	2.21	.26	1.95	1.91	.18
18	6,823	1.15	1.8	.40	.13	.02	.02	.05	.02	.07	.02	1.88	.22	1.66	2.65	.77
5	6,748	1.50	1.8	.30	..	.08	.03	.04	.03	.15	.05	2.18	.26	1.92	1.54	—.04
10	6,701	1.10	3.7	.63	.05	.04	.01	.02	.02	.08	.03	1.98	.20	1.78	1.87	.19
9	6,644	1.37	1.6	.18	.04	.17	.03	.05	.02	.26	.06	2.18	.23	1.95	2.43	.41
6	6,390	1.35	2.7	.40	.04	.09	.06	.08	.01	.21	.03	2.27	.25	2.02	1.87	.09
22	6,367	1.13	2.3	.40	.04	.12	.02	.03	.01	.19	.02	1.96	.24	1.72	2.02	.30
8	6,334	1.23	3.2	.58	..	.05	.03	.01	.01	.08	.01	2.00	.17	1.83	1.80	.17
3	6,303	1.39	1.9	.31	.02	.11	.01	.04	.02	.19	.03	2.12	.20	1.92	2.44	.44
4	6,220	1.01	2.5	.41	.23	.08	..	.05	.08	.18	.08	2.14	.21	1.93	1.48	—.02
15	5,988	1.73	2.3	.39	.03	.06	.01	.09	..	.14	.05	2.50	.32	2.18	2.37	.25
19	5,368	1.50	1.8	.34	.12	.04	.02	.06	.04	.12	.03	2.27	.23	2.04	2.54	.47
14	5,243	1.31	3.8	.65	..	.17	.01	.02	..	.23	.05	2.44	.21	2.23	1.31	—.07
17	5,150	1.06	2.4	.39	.09	.06	.06	.08	.03	.18	.03	1.98	.17	1.81	2.13	.30
20	4,851	1.12	3.0	.50	.11	.05	.03	.03	.03	.13	.06	2.06	.20	1.86	2.38	.34
12	4,702	1.47	3.6	.58	.08	.10	..	.08	..	.17	.04	2.54	.23	2.31	1.73	.00
21	4,529	1.31	5.2	.88	.05	.10	.01	.04	.01	.20	.04	2.64	.24	2.40	1.43	—.02
11	4,324	1.26	1.8	.30	.05	.14	.02	.04	.03	.26	.09	2.19	.24	1.95	2.75	.61
7	4,260	1.48	3.8	.61	.01	.06	.01	.01	..	.14	.03	2.35	.19	2.16	1.38	—.20
13	3,962	1.52	3.6	.54	.12	.11	.06	.09	.03	.19	.11	2.77	.25	2.52	2.09	.03
Ave.	5,823	1.29	2.5	.42	.06	.08	.02	.04	.02	.17	.05	2.15	.23	1.92	2.04	.22
% of Total		60		19	3	4	1	2	1	8	2	100				

TABLE 14—*Cost of producing 100 pounds of milk on farms studied in the Fairmont market (one year ending April 30, 1935)*

Farm No.	Pounds of 4% milk produced per cow	COST PER 100 POUNDS OF 4% MILK														
		Feed and pasture	LABOR		DEPRECIATION			Bull costs	Supplies and equipment	Interest on investment	Other costs	Total	Credits other than milk	Net cost	Value of milk sold and used on farm	Returns per hour of labor
			Hrs.	Value	Cows	Buildings	Equipment									
25	7,052	$1.51	4.2	$.53	$.02	$.11	$..	$.12	$..	$.16	$.02	$2.46	$.19	$2.27	$1.42	$—.08
6	6,917	1.17	2.4	.32	.01	.08	.01	.03	.02	.14	.02	1.80	.21	1.59	1.42	.06
22	6,841	1.17	3.7	.57	.05	.07	..	.01	.01	.10	.02	2.00	.20	1.80	2.33	.30
5	6,320	1.26	1.9	.30	.07	.08	.01	.02	.01	.13	.02	1.90	.20	1.70	1.54	.07
26	6,020	1.15	2.6	.45	..	.05	.03	.11	.11	.11	.05	2.06	.16	1.90	1.65	.08
19	5,887	1.22	2.3	.38	.22	.06	.01	.02	.01	.13	.08	2.13	.18	1.95	1.90	.14
10	5,822	1.47	3.7	.56	..	.02	.01	.03	.01	.05	.05	2.20	.44	1.76	1.64	.12
4	5,689	1.12	2.9	.55	.13	.04	.01	.02	.01	.07	.01	1.96	.17	1.79	1.52	.10
23	5,661	1.49	2.5	.37	.09	.06	.01	.05	.03	.12	.10	2.32	.32	2.00	1.62	.00
13	5,657	.70	4.5	.67	..	.03	.01	..	..	.04	.04	1.49	.49	1.00	1.62	.29
20	5,573	.86	3.3	.50	.09	.10	.01	.02	.01	.14	.02	1.75	.14	1.61	1.48	.11
11	5,537	1.59	3.5	.51	..	.01	.01	.03	.01	.05	.10	2.31	.34	1.97	1.44	—.01
15	5,430	1.27	3.0	.47	.06	.14	..	.03	.01	.21	.07	2.26	.22	2.04	1.60	.01
3	5,163	1.57	3.0	.43	.06	.02	..	.04	.01	.05	.01	2.19	.25	1.94	1.47	—.01
1	4,943	1.25	3.0	.46	.09	.09	.03	.03	.02	.18	.02	2.17	.19	1.98	1.56	.01
12	4,703	1.29	3.7	.56	..	.05	..	.01	.01	.11	.06	2.09	.17	1.92	1.77	.11
8	4,691	1.08	3.4	.47	.25	.06	.02	.02	..	.12	.04	2.06	.19	1.87	1.07	—.09
21	4,518	1.46	3.3	.43	..	.02	..	.02	..	.06	.01	2.00	.23	1.77	1.57	.07
16	4,492	1.24	2.5	.39	..	.07	.06	.01	.04	.15	.12	2.08	.21	1.88	1.36	—.05
24	4,448	1.50	4.5	.69	.10	.06	.02	.10	.01	.11	.03	2.62	.18	2.44	1.58	—.04
17	4,273	1.18	4.0	.61	.03	.09	.03	.19	.02	.32	.05	2.52	.18	2.34	1.84	.03
2	4,210	1.80	3.2	.51	.06	.12	.02	.06	..	.23	.04	2.84	.24	2.60	1.72	—.12
27	4,053	1.63	2.7	.32	..	.01	.01	.03	.04	.07	.02	2.13	.38	1.75	1.54	.04
18	4,010	1.31	3.4	.52	..	.05	.01	.04	.01	.12	.05	2.11	.20	1.91	1.39	.00
7	3,743	1.48	3.2	.48	..	.07	.01	.02	..	.12	.04	2.22	.33	1.89	1.48	.02
14	3,132	2.25	4.0	.61	.02	.08	.01	.01	..	.16	.06	3.20	.41	2.79	1.47	—.18
9	2,193	1.58	3.9	.46	.01	.03	.02	.02	..	.10	.04	2.26	.26	2.00	1.52	—.01
Ave.	5,080	1.34	3.0	.45	.06	.06	.01	.04	.02	.12	.04	2.14	.23	1.91	1.58	.04
% of Total		62		21	3	3	..	2	1	6	2	100				

Net cost and returns—Fairmont The net cost of producing milk in the Fairmont market varied from $1.00 to $2.79, the average being $1.91. The value of milk used and sold averaged $1.58, varying from $1.36 to $2.33. In this market the returns per hour of labor varied downward from 30c per hour to a loss of 12c per hour, the average return being 4c. These costs are shown for individual herds in Table 14.

Relation between feed, labor, and total costs Feed cost represented 60% of the total costs in Morgantown and 62% of the total in Fairmont. Labor costs were 19% and 21% respectively. The proportion of feed costs to total costs was higher in Fairmont than in Morgantown partly because of higher feed costs in Fairmont and partly because of larger depreciation and interest charges in the Morgantown area.

TABLE 15—*Comparison of the six low-cost and the six high-cost herds in the Morgantown market (1934-1935)*

ITEM	PER COW		PER 100 LBS. OF 4% MILK	
	Six low-cost herds	Six high-cost herds	Six low-cost herds	Six high-cost herds
Average no. of cows per herd	16.0	16.4	...	...
Days in milk	323	291	...	...
Pounds of 4% milk	6910	4709	...	...
Pounds of grain	1690	1379	24	29
% of protein in grain	18.9	18.6	18.9	18.6
Pounds of hay—legume	1242	575	18	12
Pounds of hay—non-legume	847	1273	12	27
Pounds of silage	4388	4610	64	98
Pounds of other roughage	50	829	1	18
Days pasture	201	203	...	...
Hours of man labor	168	168	2.4	3.6
Costs:				
Feed and pasture	$ 77.36	$ 70.96	$1.13	$1.51
Labor	30.23	27.43	.43	.58
Other costs	20.76	21.67	.30	.46
Total costs	128.35	120.06	1.86	2.55
Credits other than milk	16.51	11.71	.24	.25
Net cost	111.84	108.35	1.62	2.30
Value of milk sold and used on farm	132.50	85.45	1.92	1.81
Returns per hour all labor	.30	.03	...	...

ANALYSIS OF MORGANTOWN HERDS OF VARYING EFFICIENCY

The arrangement of data presented in Tables 15 and 16 is helpful in locating the factors responsible for low costs of production. The figures are averages of groups from each market having low or high net costs per 100 pounds of milk.

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Production In the Morgantown market the number of cows per herd was practically the same in both cost groups. Cows in the low-cost herds produced an average of 6,910 pounds of milk per year, while cows in the high-cost group produced only 4,709 pounds. Part of the difference is probably due to the inherited producing ability of the cows, but differences in management and feeding methods are associated also with high or low production. The difference in the number of days each cow was in milk is an example.

The low-cost groups averaged 323 days in milk per cow per year, while the high-cost groups averaged 291 days per cow. The effect of having cows dry an average of 74 days per year, instead of 42, would be expected to result in lower production, as it apparently did.

TABLE 16—*Comparison of the seven low-cost and seven high-cost herds in the Fairmont market (1934-1935)*

ITEM	PER COW		PER 100 LBS. OF 4% MILK	
	Seven low-cost herds	Seven high cost herds	Seven low-cost herds	Seven high cost herds
Average no. of cows per herd	15.6	13.5	...	...
Days in milk	308	307	...	...
Pounds of 4% milk	5372	4441	...	...
Pounds of grain	1300	1295	24	29
% protein in grain	18.0	15.9	26	16
Pounds of hay—legume	1393	707	...	...
Pounds of hay—non-legume	1322	1717	25	39
Pounds of silage	1173	796	22	17
Pounds of other roughage	216	676	4	15
Days pasture	208	221	...	...
Hours of man labor	152	159	2.8	3.6
Costs:				
Feed and pasture	$ 69.93	$ 66.48	$1.30	$1.50
Labor	20.12	21.84	.37	.49
Other costs	12.75	21.72	.24	.49
Total cost	102.80	110.05	1.91	2.48
Credits other than milk	14.30	10.12	.27	.23
Net cost	88.50	99.93	1.65	2.25
Value of milk sold and used on farm	81.85	71.22	1.52	1.60
Returns per hour of labor	.09	—.04	...	...

Rate of feeding Cows in the low-producing herds received less grain but more roughage, so that they were fed as abundantly as the high-producing herds. On the basis of feed fed per 100 pounds of milk the low producers were fed more abundantly than the high producers. The kind of roughage, however, was markedly different between the two groups and probably accounts for much of the difference in production. The high-producing group received 1242 pounds of legume hay per cow, that being 60% of all hay fed, and they received only 847 pounds of non-legume hay and 50 pounds of straw or stover. The low-producing group received 575 pounds of legume hay per cow, that being only 31% of all hay fed. They were

fed 1,273 pounds of non-legume hay and 829 pounds of straw or stover.

Costs other than feed and labor There was no difference in the hours of man labor required per cow between the two groups. Small differences were noted in depreciation, interest, and other charges, but in the aggregate these had very little effect on the net cost. The total amount of costs other than feed and labor was $20.76 per cow for the low-cost group and $21.67 for the high-cost group.

Feed, labor, and total costs The average cost of feed per cow was $77.36 for the low-cost and $70.96 for the high-cost herds. Labor cost was $30.23 per cow in the low-cost groups and $27.43 in the high-cost group. The total cost of keeping a cow a year in the herds with the lowest cost per 100 pounds of milk was $128.35. The group of herds having the highest cost per 100 pounds showed a per-cow cost of $120.06.

Returns The total value of manure, calves, and appreciation credited per cow in the low-cost group was $16.51, and in the high-cost group $11.71. The net cost of keeping a cow a year, therefore, was $111.84 in the low-cost group and $108.35 in the high-cost group. By reducing this to the cost per 100 pounds of milk produced, it is found that the six low-cost herds in the Morgantown market produced milk for $1.86 per 100 pounds of 4% milk. Their milk sold for $1.92 per 100 pounds and after paying all other costs left a wage, or return, of 30c for each hour of labor. The six high-cost herds produced 4% milk at a cost of $2.30 per 100 pounds. It sold for $1.81 and left a return per hour for all labor of 3c.

ANALYSIS OF FAIRMONT HERDS OF VARYING EFFICIENCY

Production The groups of low and high-cost herds in the Fairmont market show less marked differences than did the groups from the Morgantown market. The average size of herd in low and high-cost Fairmont herds was approximately the same. The average number of days each cow was in milk during the year was the same. The low-cost herds, as in the Morgantown market, had the higher production, producing 5,372 pounds of milk per cow as compared with 4,441 pounds in the high-cost herds. In both groups the cows received the same amount of grain. Cows in the low-cost group, however, were fed more roughage per cow, and of this a larger proportion was legume hay than in the high-cost group. The percentages of legume and non-legume hay were 51% and 49% in low-cost herds and 29% and 71% in high-cost herds.

Costs The total feed and pasture cost per cow in the low-cost herds was $69.93 and in the high-cost herds, $66.48. The amount and cost of labor per cow was nearly the same in both groups, the low-cost herds requiring 152 hours per cow at a cost of $20.12 and the high-cost herds requiring 159 hours per cow at a cost of $21.84.

The costs other than feed and labor were much lower for the low-cost than for the high-cost herds, $12.75 and $21.72 per cow respectively. This difference was consistent among the items included in these costs.

Returns The total cost of keeping a cow a year in the low-cost herds was $102.80 and in the high-cost herds, $110.05. The net cost of producing 100 pounds of milk was $1.65 in the low-cost herds. This milk was sold at $1.52 per 100 pounds, and the return per hour of labor was 9c. The high-cost herds produced milk at $2.25 per 100, received for it $1.60, and suffered a loss of 4c per hour of labor.

INFLUENCE OF SIZE OF HERD ON COSTS IN THE MORGANTOWN MARKET

In order to show what differences in costs, if any, might result from differences in the number of cows in the herd, the data were arranged in three groups according to the number of cows per herd. In the Morgantown market there were nine herds with from 8 to 15 cows, which were grouped as small herds. Nine herds of medium size contained 17 to 23 cows each, and six large herds contained 30 to 50 cows each.

Production The average number of days in milk per cow for each of the three groups was 314, 301, and 290. Several farms having large herds did not have room for all their cows in the milking barn. They kept just enough fresh cows on hand to keep the milking barn full. The extra cows were permitted to run dry, sometimes for longer than a normal dry period. The amount of 4% milk produced was 6,545 pounds per cow in small herds, 5,494 pounds in medium herds, and 5,735 pounds in large herds. Feeding methods did not vary consistently from group to group, as shown by amounts of feed fed, but from the amounts of feed per 100 pounds of milk it is apparent that the medium-sized herds were fed the heaviest.

Costs Feed cost per cow was most for medium herds, and though least for large herds, the difference does not suggest that there is any marked relation between size of herd and feed cost per cow. The amount of labor per cow decreased consistently with increase in size of herd, being 182, 156, and 120 hours respectively. Labor costs decreased in the same order.

Costs other than feed and labor were approximately the same for all sizes of herds, being $25.47 for small herds, $24.81 for medium herds, and $26.26 for large herds.

The total costs per cow for each of the groups were $131.91, $126.63, and $120.79 respectively. Credits for calves, manure, and appreciation of cows totaled $15.60 for small, $13.15 for medium, and $12.31 for large herds, making the net costs of producing milk equal to $116.31, $113.48, and $108.48 per cow respectively.

Returns The larger herds in the Morgantown market had a price advantage over most of the smaller herds, the price per hundredweight received by small herds being $1.54, medium herds $1.97, and large herds $2.35. The returns per hour of labor, therefore, increased more rapidly than decreasing costs would indicate. They were 8c for small herds, 12c for medium herds, and 41c for the large herds. These data and additional comparisons for the same groups are shown in Table 17.

TABLE 17—*Comparison of the cost of producing milk in small, medium, and large herds in the Morgantown market for the year ending March 31, 1935*

ITEM	PER COW			PER 100 LBS. OF 4% MILK		
	Small[1] herds	Medium[2] herds	Large[3] herds	Small[1] herds	Medium[2] herds	Large[3] herds
Average no. of cows per herd	12.3	19.8	39.0	..	..	..
Days in milk	314	301	280	..	..	..
Pounds of 4% milk	6545	5494	5735	..	..	..
Pounds of grain	1601	1655	1251	24	30	22
Pounds of hay	1967	2330	2386	30	42	42
Percentage of legume hay	58	48	63	..	..	..
Pounds of silage	5139	3318	4091	79	60	71
Pounds of other roughage	61	575	..	1	10	..
Days pasture	198	200	189	3.0	3.6	3.3
Hours of man labor	182	156	120	2.8	2.8	2.1
Costs:						
Feed and pasture	$ 75.96	$ 76.96	$ 72.60	$1.16	$1.40	$1.27
Labor	30.48	24.86	21.93	.47	.45	.38
Other costs	25.47	24.81	26.26	.39	.45	.46
Total costs	131.91	126.63	120.79	2.02	2.30	2.11
Credits other than milk	15.60	13.15	12.31	.24	.24	.21
Net cost	116.31	113.48	108.48	1.78	2.06	1.90
Value of milk sold and used on farm	100.95	108.10	135.02	1.54	1.97	2.35
Returns per hour of labor	.08	.12	.41	..	..	..

[1] 8 to 15 cows.
[2] 17 to 23 cows.
[3] 30 to 50 cows.

INFLUENCE OF SIZE OF HERD ON COSTS IN THE FAIRMONT MARKET

Production In the Fairmont market there was only one herd in the large-sized class. Seventeen herds had from 4 to 16 cows, and 9 had from 17 to 26 cows. Comparisons are presented between these two groups only. Fewer number of days in milk per cow and lower production per cow were found in the medium-sized herds. Feeding methods were very similar in all herds, as is indicated by the amount of feed fed per 100 pounds of milk. The result is that feed costs per cow were low where production was low, but that feed costs per 100 pounds of milk produced were the same in both groups.

Costs Fewer hours of labor were required per cow in the medium-sized herds than in the small herds; consequently the labor cost was least in the medium herds. The total of costs other than feed and labor was slightly less for the medium herds also.

The total costs per cow were $106.53 for small herds and $90.15 for medium herds. Credits for manure, calves, and appreciation totalled $11.91 and $10.04 per cow respectively. The net costs per cow were $94.62 and $80.11; per 100 pounds of milk they were $1.93 and $1.88 for small and medium herds. Both groups received an average price of $1.55, and both made a return per hour of labor of 3c. These data and additional comparisons are shown in Table 18.

TABLE 18—*Comparison of the cost of producing milk in small and medium sized herds in the Fairmont market*

ITEM	PER COW		PER 100 LBS. OF 4% MILK	
	Small herds[1]	Medium herds[2]	Small herds[1]	Medium herds[2]
Ave. no. cows per herd	10.5	23.2	....	....
Days in milk	310	261	....	....
Pounds of 4% milk	4915	4255	....	....
Pounds of grain	1207	1134	25	27
Pounds of hay	2419	1928	49	45
Percentage of legume hay	39	49	....	....
Pounds of silage	820	1104	17	26
Pounds of other roughage	912	256	19	6
Days pasture	210	178	4.3	4.2
Hours of man labor	162	122	3.3	2.9
Costs:				
Feed and pasture	$ 65.46	$58.34	$1.34	$1.37
Labor	23.04	18.18	.47	.43
Other costs	18.03	14.63	.36	.32
Total costs	106.53	90.15	2.17	2.12
Credits other than milk	11.91	10.04	.24	.24
Net cost	94.62	80.11	1.93	1.88
Value of milk sold and used on farm	76.00	65.89	1.55	1.55
Returns per hour of labor	.03	.03	....	....

[1] 4 to 16 cows.
[2] 17 to 26 cows.

SOME EFFECTS OF THE USE OF MILKING MACHINES

The effect of the use of milking machines on the amount of labor required and on the equipment costs is shown in Table 19. Nine herds used machines throughout the year, but figures only from the seven smaller herds were used so that a like number of hand-milked herds of equal size might be available for comparison. Among these herds the use of milking machines resulted in 50 hours less labor per cow during a year. With this small number of herds it is possible that more efficient management of some of the machine-milked herds might have influenced these results in favor of machine milking. However, observation of the individual herds indicated that proper use of the milking machine enabled one man to care for more cows than he could have otherwise, and that the saving of time probably was as great as the averages indicate for the herds of this size. The milking-machine expense per cow, $3.24, included costs of interest, depreciation, cash expenses, and electricity.

COSTS OF BULL SERVICE

The average costs per herd for bull service and breeding fees are given in Table 20. The expenses and credits were consistently higher in Morgantown than in Fairmont. The number of registered bulls used gives an indication of the reason for the difference. The tendency among Morgantown dairymen was to use registered bulls, to take better care of them, and to use them until they reached maturity. The Fairmont dairymen as a group were less likely to use good registered bulls. The general practice was to buy a young bull and discard him after a year's service. It is probable that the lower milk production of cows in the Fairmont area is a result of this practice.

TABLE 19—*Effect of the use of milking machines in some Morgantown herds*

ITEM	Machine-milked herds	Hand-milked herds
Number of herds	7	7
Number of cows per herd	22.7	21.4
Number of hours of labor per cow	129	179
Annual milk-machine expense per cow	$3.24	....

TABLE 20—*Average bull and breeding costs in 24 Morgantown herds and 27 Fairmont herds (1934-1935)*

ITEM	MORGANTOWN	FAIRMONT
Concentrates	$11.72	$ 2.92
Hay	30.07	20.38
Silage	4.35	.78
Other roughage	.19	.24
Pasture	9.59	7.76
Total feed	55.92	32.08
Labor	6.96	4.99
Depreciation	4.38	3.15
Taxes	.23	.14
Interest	2.36	1.32
Breeding fees paid out	1.00	.74
Total costs	70.85	42.43
Appreciation	2.71	3.33
Breeding fees received	1.56	....
Manure	10.50	7.60
Total credits	14.77	10.93
Net cost per herd	56.08	31.50
Average cost per cow	2.57	2.00

RETURNS FROM PRODUCING MILK IN THE MORGANTOWN AND FAIRMONT MARKETS, 1934-35

The profit or loss per cow or per 100 pounds of milk and the returns per hour of labor have all been given in connection with the presentation of costs. However, it was not convenient in those connections to present figures showing the average income received by the operator as payment for his time and managerial ability. For the eight Morgantown herds that received the high average price for their milk there was a return of $1,016.44 for the operator's time and management. The remaining 14 farm operators received no return for their own labor on their herds and failed by $8.80 to meet their other costs. Farm operators in the Fairmont market received no re-

turn for their own labor on their herds, and failed by $138.37 to meet their other costs.

SUMMARY AND CONCLUSIONS

Records were kept of the costs of producing milk on 51 farms in the market areas surrounding Morgantown and Fairmont. The work was started in April and May 1934 and continued until a 12-months' record had been obtained on each farm.

The total cost of keeping a cow a year averaged $125.14 in the Morgantown market and $109.26 in the Fairmont market. Feed and labor costs were $74.80 and $24.74 respectively in the Morgantown area. The costs of all other items totaled $24.60. In the Fairmont market feed cost per cow was $67.94 and labor cost, $22.95. The remaining costs totaled $18.37.

Credits for manure, calves, appreciation, and feed sacks sold totaling $13.29 were deducted from the total cost of keeping a cow on Morgantown farms, the remainder being the net cost of milk per cow, $111.85. On Fairmont farms the credits other than milk totaled $11.80, the net cost of milk per cow being $96.79.

The average production of 4% milk per cow was 5,823 pounds in the Morgantown market and 5,080 pounds in the Fairmont market.

The total cost of producing 100 pounds of 4% milk was $2.15 in the Morgantown market and $2.14 in the Fairmont market. Feed was the largest item of expense, amounting to $1.29 per 100 pounds of milk in the Morgantown market and $1.34 in the Fairmont market. Labor costs were next in importance, amounting to 42c per 100 pounds of milk in the Morgantown market, and 45c in the Fairmont market. The amount of labor required depended mostly on the size of the herd. The remaining costs totaled 44c per 100 pounds of milk in the Morgantown and 35c in the Fairmont market.

Credits for manure, calves, appreciation, and feed sacks averaged 23c per 100 pounds of 4% milk in both markets. These credits are deducted from the total cost of producing milk to give the net cost of production, which was $1.92 per 100 pounds of milk in the Morgantown market and $1.91 in the Fairmont market.

In the Morgantown market the following quantities of feed and labor were used per cow: 1,463 pounds of concentrates, 2,278 pounds of hay (42% of which was legume), 4,050 pounds of silage, 209 pounds of other roughage, and 145 hours of man labor. The average number of days on pasture was 195. On the basis of 100 pounds of 4% milk, the following quantities were used: 25 pounds of concentrates, 66 pounds of dry roughage, and 2.5 hours of man labor.

In the Fairmont market the quantities of feed and labor used per cow were: 1,318 pounds of concentrates, 2,276 pounds of hay (30% of which was legume), 1,513 pounds of silage, 530 pounds of other roughage, and 151 hours of man labor. The average number of

days on pasture was 209. On the basis of 100 pounds of 4% milk the following quantities were used: 27 pounds of concentrates, 65 pounds of dry roughage, and 3.0 hours of man labor.

Two objects have been kept in mind during the foregoing presentation of data: first, that this information should be helpful in determining the wholesale price of milk; and, second, that it should point out the most important factors to be considered by the producer seeking to reduce his milk production costs. It has been shown that in the Fairmont market, and among most of the producers in the Morgantown market, the producers did not receive a price for their milk sufficient to cover the costs of production. At the same time several ways were shown how the cost of production could be lowered. Thus it may appear that the question of meeting expenses in the production of milk was the producer's problem entirely. However, the methods of lowering costs will result in higher costs for a considerable time before their effects are achieved. For example, two improvements in feeding methods are advisable in the area studied: greater use of legume hays and greater care in regulating grain feeding according to milk production. Obviously a considerable period of time must elapse before ground can be limed and enough legume hay can be grown to take the place of timothy, grasses, and corn stover. During that time a large investment must be made in lime, seed, and other expenses.

Where it was indicated that more care was necessary in grain feeding, it was observed that the cows were too thin for the effect of increased grain feeding to be shown immediately in the milk pail. It is seldom that any weight can be put on a milking cow until she reaches the end of her lactation period, and then it is not until well into the following lactation that her production shows the influence of her condition. Thus, again, an investment must be made from which the returns are delayed. It was stated also that probably the greatest increase in production would come from the use of good registered bulls. When the producer breeds and raises his own heifers, at least three years must elapse before any return can be expected from the necessary outlay. If he does not care to wait, he may buy better cows, but the initial investment again is large, and the returns delayed over a long period. For these reasons it appears that if current prices fail at least to cover current costs, it cannot be expected that milk producers will be able to make investments necessary for decreasing costs of production.

It might be concluded from the comparison of machine-milked and hand-milked herds that the use of milking machines is unquestionably profitable, since 50 hours of labor were saved at a cost of $3.24. However, if the labor saved could not be put to some use that would make a return greater than $3.24 per cow, then it would be most profitable to milk by hand.